

CLAIMS

1 1. A method of selecting the tap weights W_N for an adaptive multi-tap frequency domain
2 digital filter that processes an input signal vector X from a plurality of spatially separated
3 transducers that detect energy from a plurality of sources including a target energy source and at
4 least one non-target energy source, wherein the filter receives and processes the input signal vector
5 X to attenuate noise from non-target sources and provides an output signal vector Y , the method
6 comprising the steps of:

7 parameterizing each of the tap weights W_N such that each of the tap weights W_N is
8 characterized by a vector of parameters $\underline{\beta}_{opt}$;

9 solving for each parameter of the vector $\underline{\beta}_{opt}$ by minimizing the expected power of the array
10 output signal Y ;

11 applying a robustness-control transformation to the vector $\underline{\beta}_{opt}$ to provide a robust vector
12 $\underline{\beta}_{rob}$, wherein the robustness-control transformation identifies and reduces target canceling
13 components of the vector $\underline{\beta}_{opt}$ that arise from incomplete target location knowledge while
14 preserving non-target canceling components; and

15 forming the weight vector indicative of the filter tap weights as a function of the vector
16 $\underline{\beta}_{rob}$.

1 2. A signal processing apparatus that receives an input signal vector X from a plurality of
2 spatially separated transducers that detect energy from a plurality of sources including a target
3 energy source and at least one non-target energy source, wherein the apparatus processes the input
4 signal vector X with a digital filter comprising a plurality of tap weights W_N to attenuate signal
5 noise from non-target sources and provide a resultant output signal vector Y , said apparatus
6 comprising:

7 means for parameterizing each of said tap weights W_N such that each of said tap weights

8 W_N is characterized by a vector of parameters $\underline{\beta}_{opt}$;
9 means for solving for each parameter of the vector $\underline{\beta}_{opt}$ by seeking a minimum for the
10 expected power of the output signal Y;
11 means for applying a robustness-control transformation to the vector $\underline{\beta}_{opt}$ to provide a
12 robust vector $\underline{\beta}_{rob}$, wherein the robustness-control transformation identifies and reduces target
13 canceling components of the vector $\underline{\beta}_{opt}$ that arise from incomplete target location knowledge while
14 preserving non-target canceling components; and
15 means for forming a weight vector indicative of the tap weights as a function of the vector
16 $\underline{\beta}_{rob}$.